2016 NIAC Symposium

Raleigh, NC – August 23-25, 2016

Tuesday, August 23

8:30 **Welcome & Overview** *Jason Derleth, NIAC Program Executive*

9:00 **Keynote Address** *Rick Loverd, Program Director, National Academy of Sciences The Science & Entertainment Exchange*

10:00 Break

10:20 *Michael VanWoerkom, Exoterra Resource, LLC , NIMPH: Nano Icy Moons Propellant Harvester*

10:45 *Stephanie Thomas, Princeton Satellite Systems, Inc., Fusion-Enabled Pluto Orbiter and Lander*

11:10 *Jonathan Sauder, NASA Jet Propulsion Laboratory, Automaton Rover for Extreme Environments (AREE)*

11:35 *Lynn Rothschild, NASA Ames Research Center, Urban biomining meets printable electronics: end-to-end destination biological recycling and reprinting*

12:00 Lunch

1:30 *POSTER SESSION*

2:30 *Robert Youngquist, NASA Kennedy Space Center, Cryogenic Selective Surfaces*

2:55 *Melville Ulmer, Northwestern University, Further Development of Aperture: A Precise Extremely Large Reflective Telescope Using Re-configurable Elements*

3:20 *Robert Skelton, Texas A&M University, Tensegrity Approaches to In-Space Construction of a 1g Growable Habitat*

3:45 Break

4:05 *Bruce Wiegmann, NASA Marshall Space Flight Center, Heliopause Electrostatic Rapid Transit System (HERTS)*

4:30 *Adrian Stoica, NASA Jet Propulsion Laboratory, Trans-Formers for Lunar Extreme Environments: Ensuring Long-Term Operations in Regions of Darkness and Low Temperatures*

4:55 *Michael Paul, Pennsylvania State University, SCEPS in Space - Non-Radioisotope Power Systems for Sunless Solar System Exploration Missions*

5:20 **Adjourn**

7:00 **Revolutionary Grand Challenges Session, Robert Cassanova, *The Creative Process*, and Frank Martin, *Examples of Revolutionary Grand Challenges*. Event continues to an open session with all attendees, chaired by Frank Martin - There will be microphones available for audience interaction.**

Wednesday, August 24

8:30	**NIAC Plans and Announcements**	*Jason Derleth, NIAC Program Executive*
9:00	**Keynote Address**	Dr. *Roger Launius, Associate Director for Collections & Curatorial Affairs, National Air & Space Museum*

10:00 Break

10:20 *Marco Quadrelli, NASA Jet Propulsion Laboratory, E-Glider: Active Electrostatic Flight for Airless Body Exploration*

10:45 *Masahiro Ono, NASA Jet Propulsion Laboratory, Journey to the Center of Icy Moons*

11:10 *Robert Mueller, NASA Kennedy Space Center, Mars Molniya Orbit Atmospheric Resource Mining*

11:35 *Chris Mann, Nanohmics, Inc., Stellar Echo Imaging of Exoplanets*

12:00 Lunch

1:30 *POSTER SESSION*

2:30 *Joshua Rovey, University of Missouri, Rolla, Experimental Demonstration and System Analysis for Plasmonic Force Propulsion*

2:55 *Philip Lubin, University of California, Santa Barbara, Directed Energy for Interstellar Study*

3:20 *David Kirtley, MSNW, LLC Magnetoshell Aerocapture for Manned Missions and Planetary Deep Space Orbiters*

3:45 Break

4:05 *Steven Oleson, NASA Glenn Research Center Titan Submarine: Exploring the Depths of Kraken Mare*

4:30 *Jeffrey Nosanov, Nosanov Consulting, LLC PERISCOPE: PERIapsis Subsurface Cave Optical Explorer*

4:55 Adjourn

7:00 AIAA Technology Policy discussion & cocktail party, Keynote: Congressman David Price (D-NC)

Thursday, August 25

8:30 **Other Topics** *Final Remarks, Jason Derleth*

9:00 **Keynote Address** *Dr. Penelope Boston, Director, NASA Astrobiology Institute*
Past NIAC Fellow, NIAC External Council Member

10:00 Break

10:20 *Siegfried Janson, The Aerospace Corporation, Brane Craft*

10:45 *Gary Hughes, California Polytechnic State University, Molecular Composition Analysis of Distant Targets*

11:10 *Jason Dunn, Made In Space, Inc., Reconstituting Asteroids into Mechanical Automata*

11:35 *Ratnakumar Bugga, NASA Jet Propulsion Laboratory Venus Interior Probe Using In-situ Power and Propulsion (VIP-INSPR)*

12:00 Lunch

1:30 *POSTER SESSION*

2:30 *Javid Bayandor, Virginia Polytechnic Institute and State University, Light Weight Multifunctional Planetary Probe for Extreme Environment Exploration and Locomotion*

2:55 *Bin Chen, University of California, Santa Cruz, 3D Photocatalytic Air Processor for Dramatic Reduction of Life Support Mass and Complexity*

3:20 *Justin Atchison, Johns Hopkins University, Swarm Flyby Gravimetry*

3:45 Break

4:05 *William Engblom, Embry-Riddle Aeronautical University, Flight Demonstration of Novel Atmospheric Satellite Concept*

4:30 *John Bradford, Spaceworks Engineering, Inc., Advancing Torpor Inducing Transfer Habitats for Human Stasis to Mars*

4:55 **NIAC Q&A** *NIAC Staff*

5:20 Adjourn

ABOUT NIAC:

The NASA Innovative Advanced Concepts (NIAC) Program supports early studies of visionary concepts that could one day "change the possible" in space and aeronautics. NIAC studies develop and assess revolutionary, yet credible, aerospace architecture, mission, and system concepts. They aim to enable far-term capabilities, and spawn exciting innovations to radically improve aerospace exploration, science, and operations.

NIAC also contributes to the Nation's leadership in key research and technology areas, and fosters outreach, education, and economic benefits. Part of the Space Technology Mission Directorate, NIAC is the most open-ended and far-reaching program in NASA.

2016 NIAC SYMPOSIUM SPEAKERS:

Keynote Address

Rick Loverd, Program Director
National Academy of Sciences
The Science & Entertainment Exchange

Rick Loverd directs a program of the National Academy of Sciences called The Science & Entertainment Exchange. Its mission is to inspire better science in Hollywood by introducing entertainment professionals to great science communicators. Since its launch in 2008, The Exchange has completed more than 1,500 consults including IRON MAN 2, THOR, TRON: LEGACY, AVENGERS: AGE OF ULTRON, STAR TREK: INTO THE DARKNESS, MAN OF STEEL, Fringe, CASTLE, BOURNE: LEGACY, The Good Wife, CAPTAIN AMERICA: THE WINTER SOLDIER, BIG HERO 6, and 10 CLOVERFIELD LANE. During his time at The Exchange, the program has produced more than 250 events in Los Angeles, New York, Scottsdale, and Napa Valley targeted at the Hollywood community.

Keynote Address

Dr. Roger Launius
Associate Director for Collections & Curatorial Affairs
National Air & Space Museum

Roger D. Launius is Associate Director of Collections and Curatorial Affairs at the Smithsonian Institution's National Air and Space Museum in Washington, D.C. Between 1990 and 2002 he served as chief historian of the National Aeronautics and Space Administration. A graduate of Graceland College in Lamoni, Iowa, he received his Ph.D. from Louisiana State University, Baton Rouge, in 1982 and worked as a civilian historian with the United States Air Force until 1990. He has written or edited more than twenty books on aerospace history, including Exploring the Solar System: The History and Science of Planetary Probes (Palgrave Macmillan, 2012); Coming Home: Reentry and Recovery from Space

(NASA SP -2011-593, 2012), which received the AIAA's history manuscript prize; Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years (Palgrave Macmillan, 2010); Smithsonian Atlas of Space Exploration (HarperCollins, 2009); Robots in Space: Technology, Evolution, and Interplanetary Travel (Johns Hopkins University Press, 2008); Societal Impact of Spaceflight (NASA SP-2007-4801, 2007);Critical Issues in the History of Spaceflight (NASA SP-2006-4702, 2006); Space: A Journey to Our Future (Tehabi Books, 2004); Space Stations: Base Camps to the Stars (Smithsonian Books, 2003; 2nd ed. 2009), which received the AIAA's history manuscript prize; Flight: A Celebration of 100 Years in Art and Literature (Welcome Books, 2003); Taking Off: A Century of Manned Flight (American Institute for Aeronautics and Astronautics, 2003); Reconsidering a Century of Flight (University of North Carolina Press, 2003); To Reach the High Frontier: A History of U.S. Launch Vehicles(University Press of Kentucky, 2002); Imagining Space: Achievements, Possibilities, Projections, 1950-2050 (Chronicle Books, 2001); Reconsidering Sputnik: Forty Years Since the Soviet Satellite(Harwood Academic, 2000); Innovation and the Development of Flight (Texas A&M University Press, 1999); NASA & the Exploration of Space (Stewart, Tabori, & Chang, 1998); Frontiers of Space Exploration (Greenwood Press, 1998, rev. ed. 2004); Spaceflight and the Myth of Presidential Leadership (University of Illinois Press, 1997); NASA: A History of the U.S. Civil Space Program(Krieger Publishing Co., 1994, rev. ed. 2001); and others.

He is a recipient of the Exceptional Service Medal and the Exceptional Achievement Medal from NASA. In 2009 he received the John F. Kennedy Astronautics Award from the American Astronautical Society, the Secretary's Research Prize from the Smithsonian Institution, and the Roger R. Trask Award from the Society for History in the Federal Government, 2009. In addition, he is a Fellow of the American Association for the Advancement of Science, the International Academy of Astronautics, and the American Astronautical Society; and Associate Fellow of the American Institute for Aeronautics and Astronautics. He is frequently consulted by the electronic and print media for his views on space issues, and has been a guest commentator on National Public Radio and all the major television networks.

Keynote Address

Dr. Penelope Boston
Director, NASA Astrobiology Institute
Past NIAC Fellow and NIAC External Council Member

Penelope J. Boston is a speleologist and the new Director of the NASA Astrobiology Institute at NASA Ames Research Center. She was the associate director of the National Cave and Karst Research Institute in Carlsbad, New Mexico, and founder and director of the Cave and Karst Studies Program at New Mexico Institute of Mining and Technology in Socorro. Among her research interests are geomicrobiology of caves and mines, extraterrestrial speleogenesis, and space exploration and astrobiology.

In the mid-1980s, Boston was one of the founders of the Mars Underground and helped organize a series of conferences called The Case for Mars. In March 2016 Boston was named the Director for NASA Astrobiology Institute. Her appointment is effective May 31, 2016. She has a B.S. in microbiology, geology, and psychology, and a M.S. in microbiology and atmospheric chemistry. She completed her Ph.D. from University of Colorado Boulder in 1985. During 2002-2004, she was Principal Investigator on the Caves of Mars Project, which, among other things,

studied the effects on mice of an atmosphere rich in argon, and "flat crops" that might be grown in Martian caves.

She developed the concept of small jumping robots for Mars exploration. She gave a TEDtalk about the likelihood of life on Mars in 2006. Her interest is in extremophiles (organisms which prefer or thrive in the extremes of altitude, cold, darkness, dryness, heat, mineralized environments, pressure, radiation, vacuum, variability, or weightlessness) which may be found in caves and karst on Earth, and she thinks should be looked for in equivalents of other objects in space from asteroids to planets.